DOCUMENT RESUME

ED 124 173 IR 003 564

TITLE	Annotated Bibliography of Human Factors Laboratory Reports (1945-1968). Supplement No. 2, 1973-1975.
INSTITUTION	Naval Training Equipment Center, Orlando, Fla.
REPORT NO	NAVTRAEQUIPCEN-IH-158
PUB DATE	May 76
NOTE	34p.
EDRS PRICE	MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS	*Abstracts; *Annotated Bibliographies; Cognitive Processes; Computer Assisted Instruction; Decision Making; Educational Programs; *Flight Training; *Military Training; Performance Factors; *Research and Development Centers; Simulators; Training; Training Techniques
IDENTIFIERS	Adaptive Training; Human Factors Laboratory; Navy; PLATO IV

ABSTRACT

This document provides a complete bibliographic reference and an abstract for each technical report of the Human Factors Laboratory published from 1973 through 1975. Much of the Laboratory's work during this period centered on the automation of Navy flight training. The citations are followed by journal articles and conference proceedings papers of members of the Human Factors Laboratory published during the same period. Indexes by source, author, and subject matter are also included. (CH)

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Technical Report: NAVTRAEQUIPCEN IH-158

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Human Factors Laboratory
Naval Training Equipment Center
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Human Factors Laboratory

May 1976

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SUMMARY

This document is the second supplement to the Annotated Bibliography of Human Factors Laboratory Reports (1945-1968), Technical Report: NAVTRADEVCEN IH-158, February 1969, AD 686174. It provides a complete bibliographic reference and an abstract for each technical report of the Human Factors Laboratory published from 1973 through 1975. The citations are followed by journal articles and conference proceedings papers of members of the Human Factors Laboratory published during the same period. Three indexes, Index by Source (contractor or in-house), Author Index, and Subject Matter Index are also included.

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1973

1. Jordan, S. Physiological indices of a simple cognitive task. NAVTRAEQUIPCEN TN-8, Naval Training Equipment Center. Feb. 1973, 9pp. AD 758638.

   The purpose of this study was to determine the usefulness of skin resistance and other physiological measures as indicators of simple cognitive ability such as the immediate recall of digits. Subjects were placed in a sound attenuated chamber and wired for heart rate and skin resistance recordings. The tasks consisted of the immediate recall of a 10 alternative digit sequence and a two digit alternative sequence. Results indicated no statistically significant relationship between physiological measures of alertness (skin conductance and heart rate) and a simple cognitive task (digit recall). Further experimentation is required to resolve ambiguity of results; in particular, a design is needed in which task difficulty and task duration are systematically varied over several points over a wide range.

2. Charles, J. P., Johnson, R. M. and Swink, J. R. Automated flight training (AFT), instrument flight maneuvers, preliminary report. NAVTRAEQUIPCEN 71-C-0205-1, Contract N61339-71-C-0205, Logicon, Inc. Feb. 1973, 96pp. AD 759366.

   A feasibility investigation of automated adaptive training for basic flight training was conducted. Computerized on-line course structuring, performance measurement, and verbal instructions were explored using the NAVTRAEQUIPCEN R&D simulator and trainees of varying flight experience. The results indicate effective acquisition and proficiency training, on an individual basis, can be achieved. The implications in terms of cost savings are discussed.

3. McGrath, J. J. The use of wide-angle cinematic simulators in pilot training. Final report. NAVTRAEQUIPCEN 70-C-0306-1, Contract N61339-70-C-0306, Anacapa Sciences, Inc. Mar. 1973, 141pp. AD 766507.

   In a previous program, a wide-angle (160^{0}) motion picture system was developed and 70-mm films were produced to simulate the visual experience of low-altitude flight. This study was conducted to evaluate and define the best application of this device to pilot training. Three training applications--chart interpretation, coastal entry orientation, and enroute visual pilotage--were found to satisfy the criteria of being amenable to cinematic training, operationally important, and in need of improvement in the present training system. A training program involving a combination of classroom instruction and simulator practice was developed and described. To be useful in pilot training, the films for the wide-angle simulator would have to be supplemented with additional route coverage. Recommendations are made for implementing simulator training in the current advanced flight training program and for validating its effectiveness. In addition to the primary analytic effort described above, a separately titled report

NAVTRAEQUIPCEN 70-C-0306-2), Chart Interpretation in Low-Altitude Flight was produced. This volume summarizes the special characteristics of the low-altitude visual scene and the inherent limitations of aeronautical charts as representations of the earth's surface. It is intended to supplement the training received in the proposed cinematic simulator.

4. McGrath, J. J. Chart interpretation in low-altitude flight. Final report. NAVTRAEQUIPCEN 70-C-0306-2, Contract N61339-70-C-0306, Anacapa Sciences, Inc. Mar. 1973, 43pp. AD 766466.

   This report summarizes the key concepts of chart interpretation for low-altitude navigation. It is intended to supplement the training received by U. S. Navy Replacement Pilots undertaking advanced flight training in low-altitude attack operations.

   Since chart interpretation is essentially a process of correlating the actual visual scene with its representation on an aeronautical chart, the special characteristics of the low-altitude visual scene and the inherent limitations of aeronautical charts as representations of the earth's surface are described first. Then, factors that are critical to accurate interpretation of different classes of features portrayed on charts are discussed and illustrated. The classes of features include terrain relief, aeronautical data, hydrography, transportation lines, populated places, cultural features, and vegetation. The principal theme throughout this discussion is that an aeronautical chart should be thought of as a specialized information display which, like any other cockpit display, can be used effectively only when its design is understood.

5. Sharkey, V. J. and Thomas, Roy C. The evaluation of two automated systems for teaching typewriting. Final report. NAVTRAEQUIPCEN IH-220, Naval Training Equipment Center. Mar. 1973, 82pp. AD 910406L.

   Two automated systems for teaching typing were compared with the conventional method used at the Personnelman and Yeoman Class "A" Schools at Orlando, Florida, and with the conventional method modified by the School's faculty. The basis for the comparisons were: trainee performance scores achieved during and after training, instructor ratings, classroom observations and the system's reliability, maintainability and costs. Suggestions were made with respect to possible users of the various systems.

6. Vreuls, D. Measurement of trainee performance in a captive rotary-wing device. Final report. NAVTRAEQUIPCEN 71-C-0194-1, Contract N61339-71-C-0194, Manned Systems Sciences. Jun. 1973, 84pp. AD 764088.

   A study was conducted to define and implement an exploratory approach to quantitative, machine-derived measures of human training performance

7. Klepser, W. F., Jr. and Morales, A., Jr. A study of the impact of SSN688 class submarine design on a generalized advanced casualty ship control training device. Final report. NAVTRAEQUIPCEN 71-C-0200-1, Contract N61339-71-C-0200, General Dynamics Electric Boat Division. Jun. 1973, 65pp. AD 764086.

   This is a report of the results of a study designed to (1) evaluate the feasibility of providing advanced casualty ship control training for SSN688 class submarine crews utilizing the generalized training device concept proposed in NAVTRADEVCEN Technical Report 69-C-0117-1, "A Study of a Generalized Submarine Advanced Casualty Ship Control Training Device," (2) determine what modifications to the detailed functional characteristics of the proposed device must be made to incorporate SSN688 class advanced casualty training capabilities, and (3) determine the impact of such a device on the Navy's existing submerged ship control training programs.

   It was concluded that with relatively minor modifications the proposed generalized device could provide SSN688 class advanced casualty training capabilities. The integrated training program proposed in the previous report was also found to be compatible with the advanced casualty training requirements for SSN688.

   Recommendations were made concerning the implementation of an integrated, generalized training program and the development of the proposed device to support that program.

8. Norman, D. A. Adaptive training of manual control; Relation of adaptive scheme parameters to task parameters. Final report. NAVTRAEQUIPCEN 70-C-0218-1, Contract N61339-70-C-0218, Life Sciences, Inc. Jul. 1973, 54pp. AD 764901.

   Five adaptive scheme parameters were studied in a series of adaptive training experiments designed to answer questions concerning optimal parameter values for adjustment of task difficulty. Three highly automated experiments tested 194 subjects on a multi-axis task simulating level flight. The five parameters studied were Performance Measurement Interval (PMI), turbulence Quasi-Stationary Interval (QSI), Progression:Regression ratio for task difficulty (P:R), within-trial Feedback of Difficulty Level (FBK) and vector vs. component performance indices. Subject to clarification of possible interaction between PMI and phugold frequency, results suggested that duration for PMI should be at least 20 sec or three times the reciprocal of the phugold natural frequency. Ten sec PMI was found to be undesirable for conditions of this study. Outcome for QSI suggested that training may be most effective with only a modest disturbance -- just sufficient to initiate subject inputs. P:R was found to be a significant factor but fixed rates of change of difficulty were shown to be inferior to rates proportional to error. FBK was found to improve only transfer task performance. In conjunction with data from other studies, this finding

was taken to mean that FBK is required when transfer of training for conventional training methods is low. The only difference found between vector and component difficulty adjustment was that vector required slightly fewer training trials. Recommendations were made for further improvement in adaptive training effectiveness.

9. Thomas, Rex C. Training in the underwater terrain navigation and reconnaissance trainer simulator. Final report. NAVTRAEQUIPCEN IH-222, Naval Training Equipment Center. Sep. 1973, 46pp. AD 768734.

This report describes the human factors contribution to the Physical Sciences Laboratory Underwater Terrain Navigation and Reconnaissance Simulator program. This contribution has three major components. One is the development of eight hour mission scenarios of graduated difficulty. These scenarios are to be used as a means of presenting to each trainee a standardized series of training problems and procedures to ensure adequate coverage of all operational tasks, both normal and emergency. The second major contribution is an instructor guide. This guide provides the instructor with a delineation of all the functions available to him at the instructor's station for modification of the training situation. The third major contribution consists of a number of recommendations for improving the training capability of the vehicle as a submersible simulator. These recommendations include improvements in performance measurement capability, instructor monitoring capability, instructor panels design and terrain model.

10. Rigney, J. W., Morrison, D. R., Williams, L. A. and Towne, D. M. Description and initial evaluation of a computer-based individual trainer for the radar intercept observer. Final report. NAVTRAEQUIPCEN 71-C-0219-1, Contract N61339-71-C-0219, University of Southern California. Nov. 1973, 64pp. AD 771415.

An individual trainer for giving students in RIO schools concentrated practice in procedures for air-to-air intercepts was designed around a programmable graphics terminal with two integral minicomputers and 8K of core memory. The trainer automatically administers practice in computer values of variables in the intercept triangle, and in making the turns required to put the fighter into position for a sidewinder attack. In an initial field at the RIO school, Glynco, Georgia, each of 29 students received 10 hours of practice on this trainer. Data for the values of 33 variables were automatically recorded and were analyzed.

It was concluded that this form of CAI does produce worthwhile gains in fluency of performance and understanding of the intercept problems.

11. Hammell, T. J., Gasteyer, C. D. and Pesch, A. J. Advanced officer tactics training device needs and performance measurement techniques, Volume I of II. Final report. NAVTRAEQUIPCEN 72-C-0053-1, Contract N61339-72-C-0053, General Dynamics Electric Boat Division. Nov 1973, 137pp. AD 922929.

1973

The purpose of this investigation was to determine the advanced tactics training device needs for submarine officers and to develop a technique for the measurement of tactical performance. The data base developed to perform this effort consisted of an extensive collection of operational task data and observations/discussions concerning the existing tactics training program and facilities. Findings are reported regarding the fire control party structures, training objectives and standards, training structure, training curriculum, training facility deficiencies (e.g., individual training), and training device characteristics. Recommendations concerning the training program and facilities include interfleet curriculum coordinated, device/curriculum parallel development, hardware continuity across training locations, computer-controlled generalized individual trainer, desk-top periscope visual skills trainer, and modification to existing tactical team trainers. The development of a performance measurement technique was based on utilization of a mathematical weapon system effectiveness (WSE) model to measure trainee tactical performance. Development of a model specifically for training measurement was identified. Application of the measurement technique to applied tactical scenario examples demonstrated its potential for performance evaluation. Implementation of this measurement technique is recommended. (The training objectives and performance measurement technique examples are contained in a Classified Supplement (NAVTRAEQUIPCEN 72-C-0053-1, Volume II.)

12. Semple, C. A., Jr. Training effectiveness evaluation of a prototype water-spray smoke abatement system for fire fighting training. NAVTRAEQUIPCEN 72-C-0209-1, Contract N61339-72-C-0209, Manned Systems Sciences. Nov. 1973, 55pp. AD 774920.

A study was performed to compare the training effectiveness of natural and smoke-abated simulated engine room fires through the use of objective measures of student performance augmented by student and instructor opinions. Two groups of Fire Fighting School students were trained and tested. One group received training on natural fires, followed by one natural and one smoke-abated criterion test fire. The second group received training on smoke-abated fires, followed by one natural and one smoke-abated criterion test fire. Student error data were collected at the conclusion of test fires. Results of the study showed that, during training, the group trained on natural fires performed better, but that their performance may have been due to factors other than training characteristics of the two types of fires. During criterion test fires, both groups performed comparably, indicating an equal transfer of training from both natural and smoke-abated training fires.

1973

13. Charles, J. P., Johnson, R. M. and Swink, J. R. Automated flight training (AFT), GCI/CIC. Final report. NAVTRAEQUIPCEN 72-C-0108-1, Contract N61339-72-C-0108, Logicon, Inc. Nov. 1973, 130pp. AD 772593.

A feasibility demonstration of the application of automated-adaptive training techniques for air-to-air intercept training in a flight simulator was conducted. The training task included three phases: (1) a climb task under GCI/CIC control, (2) an attack phase under RIO control and a steering dot display, ard (3) a descent phase also under GCI/CIC control. Sidewinder-type missile intercepts including head-on forward-quarter, and beam runs were incorporated into a training syllabus. Atmospheric turbulence, aircraft configuration, and bank angle were employed as adaptive variables. Performance was objectively measured for each phase, and the syllabus was restructured (on-line) based on that performance. The system was implemented on the R&D simulator at the Naval Training Equipment Center. Three 'students' were training during the demonstration. The results established the technical feasibility of such training. Recommendations for further development and evaluation are made.

1974

14. Mirabella, A. and Wheaton, G. R. Effects of task index variations on transfer of training criteria. Final report. NAVTRAEQUIPCEN 72-C-0126-1, Contract N61339-72-C-0126, American Institutes for Research. Jan. 1974, 83pp. AD 773947.

This report describes the concluding study in a three phase program. The goal of the program has been to develop and validate a set of quantitative task indices for use in forecasting the effectiveness of training devices.

In Phase I the indices were defined and in Phase II substantial and significant multiple correlation coefficients were obtained between task indices and both performance time and errors during skill acquisition.

Phase III - the index battery was validated against transfer of training criteria.

Results demonstrated that quantitative variations in task design could be related significantly and substantially to variations in transfer of training measures. On the basis of these results and those of Phase II, a set of predictive equations was constructed.

It was concluded that these equations could be employed immediately to compare the efficacy of competing trainer prototypes but that additional validation efforts in the field were necessary in order to extend confidence and generality of the methodology. It was further concluded that the battery could be useful in selecting tasks for research on the interaction of task variables and other training system variables. A demonstration of this application was carried out in which training method was studied as a function of task complexity. Results of this latter study provided some support for the hypothesis that the effectiveness of dynamic versus static procedural training varied with changes in task parameters.

15. Semple, C. A., Jr. Training effectiveness evaluation: Device 1D23, communication and navigation trainer. Final report. NAVTRAEQUIPCEN 72-C-0209-2, Contract N61339-72-C-0209, Manned Systems Sciences. Mar. 1974, 98pp. AD 776619.

A study was performed to evaluate the training effectiveness of Communication and Navigation Training Device 1D23. Four objectives were addressed: Assess impacts of training in the device upon student dead reckoning navigation performance. Determine impacts of training in the device upon communication and navigation performance in point-to-point and airways navigation. Determine impacts of increased amounts of training in the device upon communication and navigation performance in dead reckoning, point-to-point, and airways navigation.

1974

Develop design oriented information for application to further training device designs. Flight grades and supplemental measures of student performance were analyzed. Instructor and student opinion data were obtained to supplement direct observations by the author. Training effectiveness of the device for dead reckoning, point-to-point and airways navigation was documented. No performance improvements were found as a result of the additional training which was examined. Design oriented information was developed.

16. Matheny, W. G. An experimental investigation of the role of motion in ground-based trainers. Final report. NAVTRAEQUIPCEN 71-C-0075-1, Contract N61339-71-C-0075, Life Sciences, Inc. Apr. 1974, 64pp. AD 778665.

The purpose of this study was to provide data relevant to the specification of motion requirements for ground-based trainers for aircraft pilots. The study investigated three categories of motion: (1) no motion, (2) motion correlated with the output of the aircraft equations and visual displays, and (3) random uncorrelated motion. Four bandwidths of correlated and three bandwidths of uncorrelated motion were investigated. Both man-machine system output measures, e.g., altitude deviations, and operator output measures, e.g., stick movements, were used as measures of performance in studying the effects of the experimental conditions. The results showed that none of the experimental conditions effected significant changes in man-machine system performance. However, significant differences were obtained among pilot performance measures for the conditions, with respect to the pilot output performance measures (1) no differences were found between no motion and uncorrelated motion of high bandwidth, (2) significant differences in pilot output were obtained between the correlated motion conditions and both the uncorrelated and no motion conditions, and (3) narrow bandwidth correlated motion was found to be equivalent to wide bandwidth. Pilot ratings taken of the various experimental conditions were inconsistent and not related to either man-machine system performance or pilot output performance. Recommendations are made for similar design characteristics and suggestions are given relevant to the remaining data points necessary before a complete specification of motion characteristics for ground-based trainers can be made.

17. Hammell, T. J. Gasteyer, C. D. and Pesch, A. J. Advanced officer tactics training device needs and performance measurement technique, Volume II of II. Final report. NAVTRAEQUIPCEN 72-C-0053-1, Contract N61339-72-C-0053, General Dynamics Electric Boat Division. Apr. 1974, 131pp. AD 531491.

This volume, Volume II of II is classified CONFIDENTIAL and is the supplement to NAVTRAEQUIPCEN 72-C-0053-1 which is unclassified. It contains the training objectives and performance measurement technique examples. The purpose of this investigation was to determine the advanced tactics training device needs for submarine officers and to

develop a technique for the measurement of tactical performance. The data base developed to perform this effort consisted of an extensive collection of operational task data and observation discussions concerning the existing tactics training program and facilities. Findings are reported regarding the fire control party structures, training objectives and standards, training structure, training curriculum, training facility deficiencies (e.g., individual training), and training device characteristics. Recommendations concerning the training program and facilities include interfleet curriculum coordinated, device/curriculum parallel development, hardware continuity across training locations, computer-controlled generalized individual trainer, desk-top periscope visual skills trainer, and modification to existing tactical team trainers. The development of a performance measurement technique was based on utilization of a mathematical weapon system effectiveness (WSE) model to measure trainee tactical performance. Development of a model specifically for training measurement was identified. Application of the measurement technique to applied tactical scenario examples demonstrated its potential for performance evaluation. Implementation of this measurement technique is recommended.

18. Hammell, T. J. and Pesch, A. J. Basic and advanced submarine officer's tactical training device requirements. Executive Summary. NAVTRAEQUIPCEN 72-C-0053-1(A), Contract N61339-72-C-0053, General Dynamics Corp. Electric Boat Division. Apr. 1974, 27pp. AD 780778.

    This report is an executive summary of several documents which addressed the subject of basic and advanced officer tactics training. The purpose of these investigations was to examine submarine officer's tactics training requirements and to recommend an overall plan to advance submarine tactical training technology. The major recommendations center about augmentation of current training methodology via computer driven performance effectiveness models. Based on the output of these models, future training devices may include diagnostic displays of training performance expressed in Weapon System Effectiveness (WSE) terms, models of knowledgeable reactive opponents, quantitative trainee feedback related to specific actions, libraries of trainee performance, and improved instructor's interaction consoles. Recommendations also include the development of generalized individual trainers, specific modifications to existing devices, and locations for new devices. Finally, the recommendation is made to commit resources to a long term development plan to achieve the commulative growth required to develop and advance the concepts detailed in the investigation.

19. Semple, C. A. Guidelines for implementing training effectiveness evaluations. Final report. NAVTRAEQUIPCEN 72-C-0209-3, Contract N61339-72-C-0209, Manned Systems Sciences. Apr. 1974, 35pp. AD 778349.

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1974

This document presents guidelines for planning, implementing and documenting training effectiveness evaluations. The guidelines are intended to assist researchers in coping with many of the constraints associated with executing empirical research in operational settings.

20. Feuge, R. L., Charles, J. P. and Miller, R. Feasibility of automated adaptive GCA controller training system. NAVTRAEQUIPCEN 73-C-0079-1, Contract N61339-73-C-0079, Logicon, Inc. Apr. 1974, 87pp. AD 778312.

An analysis of the conceptual feasibility of using automatic speech recognition and understanding technology in the design of an advanced training system was conducted. The analysis specifically explored application to Ground Controlled Approach (GCA) controller training. A systems engineering approach was followed to determine the feasibility of such a system. Design features were developed including training requirements and constraints. An evaluation of the state-of-the-art of speech understanding systems was conducted.

The results of the study indicate that the technology for automatic speech recognition and understanding is adequate to warrant design and construction of a feasibility demonstration model for the precision approach radar (PAR) phases of GCA controller training. As conceived, the system would accept student controller speech and convert it to functional 'commands' to drive the simulated radar return of an aircraft on a display in a manner much as the controller guides an actual aircraft on final approach to landing. Other design features would include objective performance measurement and adaptive syllabus control for increasing the difficulty of the training problem as a function of the student's performance. It is recommended that a technical feasibility demonstration be implemented.

21. Rigney, J. W., Morrison, D. K. and Williams, L. A. A guide for the application of performance structure oriented CAI in naval training: a working paper. NAVTRAEQUIPCEN 73-C-0065-1, Contract N61339-73-C-0065, University of Southern California. Jul. 1974, 62pp. AD 784379.

Considerations and procedures for applying Performance-Structure Oriented CAI in Naval training are described, in terms of a general diagram of the necessary elements in a CAI system. The fundamental objective is to lead the student to develop his own cognitive structures that will serve him for generating the surface structures of tasks. The instructional system must accomplish this by generating and scheduling a suitable instructional sequence for each student. The developmental steps, from job task-structure analyses to computer programs, are described. Techniques for generalizing these procedures fall into two categories: higher-level programming languages that would permit more rapid production of programs for specific applications, and general-purpose programs that accept data modules specific to an application. Both kinds of techniques have been used in earlier

applications. Examples of instructional flowcharts, programmer's flowcharts, and data encoding procedures used in the development of the RIO trainer are presented to illustrate key points in the developmental steps.

22. Vreuls, D. Trainee performance measurement development using multivariate measure selection techniques. NAVTRAEQUIPCEN 73-C-0066-1, Contract N61339-73-C-0066, Manned Systems Sciences. Sep. 1974, 53pp. AD 787594.

A study was conducted to extend a descriptive structure for measuring human performance during training to a fixed-wing, high-performance aircraft simulation, and to develop measure selection statistical techniques. The effort required (1) definition of candidate performance measures, (2) development of computer programs to acquire raw data and produce candidate measures, and (3) most especially development of methods to find a small, efficient set of measures which can (1) discriminate between levels of proficiency and (2) predict performance later in training. Therefore, two set selection methods were developed. One, based in part on a multiple discriminant analysis model, was able to generate a set which would discriminate between early and later performance, and lead to a single composite score. The second, based in part on a canonical correlation model, was able to predict later performance although the data revealed the need for additional criteria in the selection of the predictive set. It was recommended that results be verified by collecting data from additional participants.

23. Rigney, J. W., Morrison, D. K., Williams, L. A. and Towne, D. M. Field evaluation of Model II of the computer-based, individual trainer for the radar intercept officer. NAVTRAEQUIPCEN 73-C-0065-2, Contract N61339-73-C-0065, University of Southern California. Oct. 1974, 53pp. AD A002705.

Model II of the basic skills intercept trainer for Radar Intercept Officers was evaluated in a school environment. Model II incorporated different instructional sequencing logic, additional weaponry capability, and additional graphic features from Model I (developed under a previous project). These added features were designed to assist the student in understanding intercept geometry and in learning to use the B-scan display. One (N=31) of two random groups practiced on a trainer with these additional graphics, the other group (N=29) used a version of the trainer without these features.

The group using the enhanced trainer took longer and required more problems to satisfy the trials-to-criterion logic used in the practice session. All students expressed predominantly favorable attitudes toward the trainer.

Two measures of transfer were used: a twenty-item post-test using different problems in a random sequence, and an inflight checklist administered during each of eleven practice flights and two traininig phases per student. The two groups did equally well on the post-test. The group using the enhanced trainer was rated slightly higher than the other on the inflight checklist on both of the inflight training phases.

Explanations for these results are discussed, and recommendations are offered. The principal recommendation is that the self-standing, CAI-system-in-a-terminal, having been demonstrated to be a viable and effective concept in a Naval training environment, should be developed as an attractive alternative to (1) large centralized-processor, distributed terminal CAI systems for use in remote environments, and (2) multimillion dollar simulators, for certain types of job skills training.

24. Pesch, A. J., Hammell, T. J. and Ewalt, F. M. Tactical decision-making training system design. NAVTRAEQUIPCEN 73-C-0158-1, Contract N61339-73-C-0158, Eclectech Associates, Inc. Nov. 1974, 72pp. AD A002704.

This report describes the design characteristics for a prototype generalized tactical decision-making training system which may serve as an empirical test bed for applied research. The objective of this subsequent research will be to create a systematic means of training Navy tactical decision makers. The prototype training system is comprised of a four-level generalized training structure which presents the outline of a decision-making curriculum and a tactical decision-making model. The model is designed for computer implementation in an individualized instructional setting. The model contains tactical situation generators such as target motion, environmental effects, sensor characteristics, and ships tactical capabilities required to present a trainee with realistic decision-making training on the MK 113 Mod 10 (MK 81 Analyzer) Submarine Fire Control System. The model also contains routines specifically designed for training and empirical evaluations. These include: diagnostic feedback, performance library, and instructional control.

The report documents tactical decision-making training objectives and describes a training strategy which defines the software and hardware characteristics of the training system. The report also defines the need for, and characteristics of, a computer language especially designed for training simulation.

1975

25. Spencer, G. J. and Hausser, D. L. Use of computer-assisted instruction for interpersonal skill training - a pilot study. NAVTRAEQUIPCEN 73-C-0133-1, Contract N61339-73-C-0133, University of Michigan. Mar. 1975, AD A009361.

A pilot study was conducted to investigate the application of the PLATO IV system to training interpersonal skills. As part of the development of an experimental design to be undertaken in the future, several activities were involved. Suitable interpersonal skills were considered and a single one, giving effective performance feedback, was chosen for the pilot study. Training materials for this skill were developed and coded into the PLATO IV system. A small sample of experimental and control subjects was tested and trained, and data about their feedback skill performance and companies' performance were collected and analyzed. It appears that the training had some effect on skill performance. The proposed experimental design was evaluated as suitable for application to a larger study.

26. Parker, E. L. Generalized training devices for avionic systems maintenance. NAVTRAEQUIPCEN 73-C-0091-1, Contract N61339-73-C-0091, Anacapa Sciences, Inc. Apr. 1975, 84pp. AD A009805.

A research study was conducted to determine feasibility and desirability of developing generalized training equipment for use in avionic systems maintenance training. It consisted of a group of survey and analytic tasks whose results, taken together, provide useful guidance for development of generalized maintenance training equipment to serve needs of Naval Aviation community in future years.

There were four specific objectives: (1) to assess extent of maintenance task commonality existing among airborne weapons systems; (2) to identify new developments and design trends in avionics equipment; (3) to recommend development of specific generalized training devices, as appropriate; and (4) to describe general design characteristics of the training equipment recommended.

The following tasks were completed herein: survey and inventory of operational aircraft, selection of sample of avionics systems, identification of major task requirements for those systems, survey of new developments in avionics system design, and survey of present maintenance practices.

Recommendations were made for generalized training equipment development: 1. generalized communication system maintenance trainer for avionics rates recommended and described, 2. evidence added to previous research for development of digital systems training device, augmented for avionics training, 3. series of generalized devices for teaching lower level maintenance skills to less-highly-qualified trainees than those presently maintaining airborne weapons systems.

1975

27. Rigney, J. W., Towne, D. M. and Morrison, D. K. Preliminary specifications for an AWG-9 WCS maintenance trainer for the F-14 aircraft. NAVTRAEQUIPCEN 74-C-0065-1, Contract N61339-74-C-0065, University of Southern California. Apr. 1975, 49pp. AD A009365.

    This report contains preliminary specifications for an AWG-9 WCS maintenance trainer. These were derived using a procedure described in earlier reports in this series which capitalizes on the hierarchical nature of serial action tasks to develop interactive segments of CAI for Naval technical training. In developing trainer specifications using this method, detailed task analytic and flowchart methods are utilized in conjunction with established principles of human learning to construct a tentative instructional strategy. Implications of this strategy are then cast in terms of the realities of available hardware (e.g., computer graphics) and software (e.g., TASKTEACH) to determine preliminary training system specifications. Cost-benefit trade-offs are then made,and the entire process is iterated by successive approximation until a sufficiently specific guide to hardware acquisition and computer programming can be produced.

    One of the more unique elements to the approach is that the natural interdependencies among serial action subtasks are allowed to influence very strongly the instructional strategy and computer monitoring of trainee performance, thereby greatly reducing the need for frame-by-frame construction of CAI materials.

28. Daniels, R. W. and Alden, D. G. The feasibility of generalized acoustic sensor operator training. NAVTRAEQUIPCEN 74-C-0067-1, Contract N61339-74-C-0067, Honeywell, Inc., Systems & Research Center. May 1975, 84pp. AD A011846.

    This program explored the feasibility of a generalized approach to acoustic sensor operator training and resulted in recommendations concerning implementation. The program involved the analysis of the task, skill, and knowledge requirements for acoustic sensor operators (ASO) across a representative sample of sensor systems. The program approach was divided into three major phases.

    Phase I involved the establishment of an ASO task data base which contained behavioral task statements descriptive of the ASO's operational activities. During Phase II these task statements were taxonomically encoded and analyzed to determine commonalities in task requirements for various acoustic sensor systems in the sample. Additional analyses of the coded task data were used to identify common skill and knowledge requirements for those tasks. During Phase III these analyzed data were interpreted to develop an estimate of the feasibility of Generalized Acoustic Sensor Operator Training (GASOT), based on task, skill and knowledge commonality. Recommendations were then developed for the nature of a GASOT system.

In addition, during Phase III the feasibility of implementing was addressed. Issues addressed included the potential modifiability of a GASOT system to meet the training requirements of new acoustic systems, and the impact of implementing a GASOT course on the existing ASO training pipeline.

Finally, recommendations were made concerning the feasibility of Generalized ASO training based on task, skill, and knowledge commonalities and the Navy training environment.

29. Stark, E. A., Faconti, V. and Mortimer, C. Study to determine the requirements for an experimental training simulation system. NAVTRADEVCEN 69-C-0207-1, Contract N61339-69-C-0207, Singer-General Precision, Inc. Feb. 1971, 338pp. AD A011377.

The purpose of this study was to design a simulation system capable of supporting human factors experiments in the development of training device designs. The study was performed in two phases. The first phase consisted of a review of tasks performed by the operators of four general types of military systems, an analysis of problems experienced in the development of devices for training these tasks and the identification of design areas in which experimentation is required. Five design areas were identified, including: (1) design of the trainee station for training specific tasks and under particular circumstances, (2) the effects of various levels of system fidelity on training, (3) determining requirements for representation of the environment outside the operator's (trainee's) station, (4) development of techniques for automated training, and (5) development of effective instructor station designs. The second study phase produced system design recommendations and a five-year implementation plan, to permit system procurement in five relatively discrete incremental modules. Each of the five modules can be employed independently, and each can also be integrated with the preceding procurement to provide additional, integrated functions. Procurement and integration of all five modules will provide a total capability consistent with the overall purpose of the study.

30. Nickerson, R. S. and Feehrer, C. E. Decision making and training: a review of theoretical and empirical studies of decision making and their implications for the training of decision makers. NAVTRAEQUIPCEN 73-C-0128-1, Contract N61339-73-C-0128, Bolt Beranek and Newman, Inc. Aug. 1975, 21pp. AD A014490.

This report reviews theoretical and empirical studies of decision making. The purpose of the review was to identify results that would be applicable to the problem of training decision makers.

The literature on decision making is extensive. However, relatively few studies have dealt explicitly with the problem of training in

decision-making skills. The task, therefore, was to gather from the general literature on decision making any implications that could be found for training.

Decision making is conceptualized here as a type of problem solving, and the review is organized in terms of the following component tasks: information gathering, data evaluation, problem structuring, hypothesis generation, hypothesis evaluation, preference specification, action selection, and decision evaluation. Implications of research findings for training are discussed in the context of descriptions of each of these tasks.

A general conclusion drawn from the study is that decision making is probably not sufficiently well understood to permit the design of an effective general-purpose training system for decision makers. Systems and programs could be developed, however, to facilitate training with respect to specific decision-making skills. The development of more generally applicable training techniques or systems should proceed in an evolutionary fashion.

Training is one way to improve decision-making performance; another is to provide the decision maker with aids for various aspects of his task. Because training and the provision of decision aids are viewed as complementary approaches to the same problem, the report ends with a discussion of several decision-aiding techniques that are in one or another stage of study or development.

31. Cohen, J. L. and Fishbein, M. Development and research utilizing the PLATO IV system for company commander behavioral change training. NAVTRAEQUIPCEN 73-C-0129-1, Contract N61339-73-C-0129, University of Illinois. Aug. 1975, 103pp. AD A014213.

An investigation of the possible utilization of the PLATO IV System as a behavioral change training device for use with company commanders at Recruit Training Command, San Diego, was undertaken. Working within the theoretical framework developed by Fishbein, questionnaire data was collected to assess the possible relationships among attitudes and specific task-oriented behaviors. On the basis of the results from these measures, computer-assisted instructional materials were initially developed for use on the PLATO IV System. This report presents summaries of the data analyses and the framework of the developed computer programs.

32. King, W. J. and Duva, J. S. New concepts in maintenance trainers and performance aids. NAVTRAEQUIPCEN IH-255, Naval Training Equipment Center. Oct. 1975, 166pp. AD A017216.

As a leader in the field of maintenance training research and development, the Human Factors Laboratory of the Naval Training Equipment Center (NAVTRAEQUIPCEM) convened a workshop entitled "New Concepts in

Maintenance Training Research," on 7 - 10 April 1975. Such workshops are one of the many devices the Laboratory uses to keep abreast of the state-of-the-art in hardware and training technology integration. Such integration is, of course, vital to the design and development of cost/effective training systems.

The conference goals were to:

. Review recent developments in maintenance training technology

. Develop guidelines for future research

. Produce a report summarizing the current state-of-the-art.

The invited participants had the advantage of having read all the papers prior to the meeting. Because of this familiarity with the technical content, a real exchange of technical data and knowledge was possible. Each participant had been asked to include some coverage of the following three elements of general interest: (1) data on any empirical tests or experiments using his approach, (2) presumed cost-benefit figures for his method, and (3) plans and/or concepts for the future.

The backgrounds and interests of the participants varied widely - psychologists, educational specialists, and engineers pooled their expertise in such diverse areas as computer-based training, simulation, and technical publications. The result was a wide variety of approaches to the maintenance training problem, for example, technical publications versus simulation, mini versus maxi simulation, and hands-on simulation versus simulated hands-on.

It was interesting to observe the melding of divergent points of view during the three-day discussions and the resulting concepts which emerged. Some of these are discussed in the last chapter of this document.

There was agreement that this type of workshop would be a fruitful event if held annually. The goal would be to maintain a free exchange of new developments and ideas critical to economical and effective maintenance training and aiding techniques.

33. Feurzeig, W., Cohen, D., Lukas, G. and Schiff, M. Research on high-level adaptive training systems. NAVTRAEQUIPCEN 73-C-0081-6, Contract N61339-74-C-0081, Bolt Beranek and Newman, Inc. Nov. 1975, 115pp.

The long term objective of this research is to develop an automated system for instrument flight training which incorporates capabilities for recognizing malfunction patterns and diagnosing the trainee's underlying difficulties. This is necessary because individual

trainees experience distinctly different conceptual problems. As the core of such a system, a computer-based instrument flight training simulator, ORLY, was designed. To aid in its development and use, a critical review was made of the literature on adaptive training models and applications. Computer program implementations of the ORLY simulator were made on the Bolt Beranek and Newman PDP-10 and the Naval Training Equipment Center PDP-9 computation facilities. ORLY-based protocol experiments with trainees and instructor pilots were designed to elicit and characterize trainees' malperformance patterns and instructors' diagnostic procedures and strategies.

34. Modrick, J. A., Schmitz, H. G. and Gardner, J. A. Performance specification for a maintenance simulator for the AN/ALQ 126 transceiver. NAVTRAEQUIPCEN 74-C-0128-1, Contract N61339-74-C-0128, Honeywell, Inc., Systems and Research Center. Dec. 1975, 82pp. AD A020588.

The objective of this program is the development of a performance specification for a simulator to train technicians to maintain the AN/ALQ 126, an airborne electronic warfare receiver-transmitter. The study was conducted to provide an alternative approach to the use of operational equipment for training. The technicians are to be trained for intermediate level maintenance tasks; the educational level is the Navy's B and C school.

The performance specification consists of the functions, capacities, and performances required of the simulator at level of specificity and comprehensiveness to permit a subsequent engineering design of a simulator. Design decisions and choices among alternative designs are not made.

The AN/ALQ 126 consists of two boxes of electronic components. The technician performs two types of maintenance tasks: 1). A ready for issue (RFI) check and 2). Fault isolation. Fault isolation is done to a shop replaceable assembly (SRA). The final action in fault isolation is either alignment or remove and replace. In performing intermediate level maintenance the technician uses the AN/ALM 106B, a semiautomatic test set.

The concept of the simulator for maintenance training and its application are discussed. The simulator is a computer-operated system containing 10 student stations controlled from one instructor station. The general (non-system-specific) functional requirements are defined in terms of the components, functions, and operating times required of the student and instructor stations. The requirements for simulating modules and components of both the AN/ALQ 126 and AN/ALM 106B are presented in detail in terms of what elements must be functional for training. Information is also provided on the requirements for simulation of maintenance procedures and waveforms displayed on the oscilloscope. A set of representative and critical

malfunctions to be simulated for training are described. An overview of the AN/ALQ 126 systems and the current training program is provided.

35. Ricard, G. L. and Norman, D. A. Adaptive training of manual control: performance measurement intervals and task characteristics. NAVTRAEQUIPCEN IH-252, Naval Training Equipment Center. Dec. 1975, 20pp.

This experiment extends the findings of a previous study, NAVTRAEQUIPCEN 70-C-0218-1, concerning relations between the measurement of trainee performance and parameters of the simulated airframe of an adaptive, aircraft roll-control, training task. Five values for the performance measurement interval (PMI) were chosen so as to bracket the roll rate time constant (T_R) of the simulator's lateral transfer function, and an acquisition-then-transfer experimental design was used to assess trainee skill development. When the PMI was shorter than the break frequency ($1/T_R$) of the lateral transfer function, subjects experienced greater difficulty in developing criterion-level control than when longer PMI's were used. These data indicate that the 20 second PMI selected by the previous study was appropriate for a roll control task, and more important, reinforce that report's contention that the relations exist between rules of the adaptive logic and parameters of the simulated airframe.

36. Cooper, F. R., Harris, W. T. and Sharkey, V. J. The effect of delay in the presentation of visual information on pilot performance. NAVTRAEQUIPCEN IH-250, Naval Training Equipment Center. Dec. 1975, 77pp.

The effects of delay in the presentation of visual information on pilot performance during simulated carrier landing tasks were investigated. The TRADEC research flight simulator was used in conjunction with an Evans and Sutherland LDS 1 calligraphic visual display system for several different initial conditions, with and without delayed visual presentation, in conducting evaluations of pilot learning performance and piloting technique. The experimental construction, conduction, data analysis and results are presented herein.

1973

37. Blaiwes, A. S. Some training factors related to procedural performance. Journal of Applied Psychology, 1973, 58(2), 214-218.

Four experimental tasks were used to test the effects on procedural performance of providing special instructions on logical-tree construction and use and of limiting versus not limiting the time available for studying the task instructions. Results indicated that performance accuracy was statistically better when either one or both logical-tree instruction and practice was provided and the task instruction study time was limited, than when subjects were permitted to study the task instruction for as long as they chose and in whatever way they chose. It was concluded that quite simple procedures for familiarizing subjects with logical-tree operations can improve performance on procedural tasks. It also appeared that placing a limit on the time available for study of instructions can be better than permitting unlimited time.

38. Blaiwes, A. S., Puig, J. A. and Regan, J. J. Transfer of training and the measurement of training effectiveness. Human Factors, 1973, 15(6), 523-533.

Transfer of training research has been conducted on actual training systems to determine: (1) the effectiveness of present training; (2) whether the training can be improved; and, (3) how the training might be improved. The present paper includes some major methodological and analytical considerations in performing this research, the experimental and descriptive models to use in investigating and expressing transfer, cost effectiveness evaluations, and aspects of the training system to be included in the study. A number of conclusions are derived from the transfer research and some popular research themes are identified. Desirable features for an applied research program for military training purposes are presented. problems arising from the use of the transfer of training model are traced to operational constraints placed on experimental manipulation and control, and to the inadequacy of performance measurement systems. Solutions to these problems are discussed. One solution provides alternate methods to the transfer of training model for evaluating the effectiveness of a training system. Another approach recommends the employment of laboratory simulations of training or operational situations for transfer research.

39. Blaiwes, A. S. Improving social behavior with PLATO IV. Proceedings of the Sixth Naval Training Equipment Center/Industry Conference, NAVTRAEQUIPCEN IH-226, Orlando, Florida, 13-15 November 1973. AD 768756.

The PLATO IV computer-based education system and some of the rationale and approach with respect to its evaluation are described briefly. PLATO IV will be evaluated in its application to the training

of factors related to the optimization of social influence; specifically, that influence exerted between company commanders and recruits at recruit training commands. Current approaches to teaching social skills are inadequate to meet the needs for such skills. Computer-administered instruction offers a novel and potentially effective medium through which to improve, through training, the quality of social influence.

40. Puig, J. A. Visual tolerances for simulator optics. Proceedings of the Sixth Naval Training Equipment Center/Industry Conference, NAVTRAEQUIPCEN IH-226, Orlando, Florida, 13 - 15 November 1973. AD 768756.

This paper discusses problems associated with the determination of tolerances for optical systems which are directly coupled to the human eye. Adequate total performance of the combined physical and physiological optical systems is shown to be dependent upon modification of the optical image by the eye and processing of the retinal image by the brain. Physical, physiological, and psychological interactions are considered for application to simulator optical design.

1974

41. Pesch, A. J., Hammell, T.J. and Lane, W. P. Computer simulation for a command and control training system. Proceedings of the Seventh Naval Training Equipment Center/Industry Conference, NAVTRAEQUIPCEN IH-240, Orlando, Florida, 19 - 21 November 1974. AD A000970.

    A digital simulation of a submarine tactical system is described. The simulation was developed for the purpose of providing an experimental system for investigating and testing of alternate techniques for training decision making in a tactical command and control setting. The design of the training system, based on an analysis of submarine officer instructional requirements, and associated performance measurement capabilities are described.

42. Rigney, J. W. and Blaiwes, A. S. A guide for the application of performance structure-oriented CAI in military jobs. Proceedings of the Seventh Naval Training Equipment Center/Industry Conference, NAVTRAEQUIPCEN IH-240, Orlando, Florida, 19 - 21 November 1974. AD A000970.

    A system for facilitating the production of computer-aided instruction (CAI) for the Navy is described. This system basically taking the form of a model or theory of CAI, is in part derived from and evaluated by empirical studies. The system can suggest to course authors various components of CAI and steps associated with the development of these components that need to be considered in the process of the course construction.

43. Conway, E. J. and Norman, D. A. Adaptive training: new directions. Proceedings of the Seventh Naval Training Equipment Center/Industry Conference, NAVTRAEQUIPCEN IH-240, Orlando, Florida, 19 - 21 November 1974. AD A000970.

    Previous adaptive training systems developed under NAVTRAEQUIPCEN sponsorship have been limited in ability to accommodate individual student differences. They have adapted along paths pre-defined by the designer for all students. Adaptation has been based on current student performance while fixed presentation media and training strategies have been used. This paper describes how the training process may be improved by tailoring strategy and media to individual requirements. Further improvement can result when student background and personality variables are taken into account. In addition, the improved system may be made to some extent self-organizing so that a continuous self-analysis and modification of control laws derived from data for preceding groups of students takes place.

44. Vreuls, D. and Goldstein, I. In pursuit of the fateful few: a method for developing human performance measures for training control. Proceedings of the Seventh Naval Training Equipment Center/Industry Conference, NAVTRAEQUIPCEN IH-240, Orlando, Florida, 19 - 21 November 1974. AD A000970.

This paper describes the development of a method for producing and selecting proper human training performance measures. The method supplements intuitive and analytic processes of measure selection with a sequence of empirical techniques to guarantee reduction of a measure candidate pool to the smallest, efficient set attainable. The measures obtained have the ability to discriminate performance levels and have prediction qualities for each maneuver segment and task variation tested. The method will be used to generate student performance measures for use in automated adaptive training with aviation weapon system simulators.

45. Goldstein, I., Norman, D. A., Charles, J. P., Feuge, R. L., Grady, M. W. and Barkovic, M. H. Proceedings of the Seventh Naval Training Equipment Center/Industry Conference, NAVTRAEQUIPCEN IH-240, Orlando, Florida, 19 - 21 November 1974. AD A000970.

This paper introduces the rationale for and general design of an experimental training system based on automated adaptive principles for instructing student GCA controllers in the PAR phase of the final approach. The purpose of the laboratory facility will be to check out the functioning of the component subsystems and the overall training effectiveness of the total system. Detailed requirements and technical solutions are presented.

46. Puig, J. A., Johnson, R. M. and Charles, J. P. Evaluation of an automated GCA flight training system. Proceedings of the Seventh Naval Training Equipment Center/Industry Conference, NAVTRAEQUIPCEN IH-240, Orlando, Florida, 19 - 21 November 1974. AD A000970.

A plan is outlined for evaluation of an automated flight training system integrated with the TA-4J, Operational Flight Trainer (Device 2F90). The proposed experimental design is presented and methods for carrying out the experiment are discussed.

47. Stark, E. A. and Puig, J. A. Use of cathode-ray tubes at instructor stations. Proceedings of the Seventh Naval Training Equipment Center/Industry Conference, NAVTRAEQUIPCEN IH-240, Orlando, Florida, 19 - 21 November 1974. AD A000970.

Experience with current CRT instructor stations is reviewed, together with the instructional tasks accomplished in flight simulators.

Recommendations are made for the further definition of the simulator instructor's tasks, and for the extended application of CRT's. Emphasis is placed on the analysis of requirements for the display and formatting of instructional information.

48. Blaiwes, A. S. Formats for presenting procedural instructions. Journal of Applied Psychology, 1974, 59(6), 683-686.

Thirty male college students performed a mock communication controller's task under three different instructional formats (short sentences, logical tree and coding). Accuracy did not differ as a function of instructional format for three "easier" types of problems. However, for two "more difficult" problem types, coding resulted in significantly ($p < .01$) more accuracy in one case, while coding and short sentences showed significantly ($p < .01$ and $p < .05$ respectively) greater accuracy in another. It was concluded that (a) format variations mainly influence difficult tasks: (b) logical-tree superiority appears to be related to the number of conditions at a choice point and/or retention conditions; and (c) coding can be a potent technique.

49. Blaiwes, A. S. and Rigney, J. W. A guide for developing performance-structure oriented computer-administered instruction: theory and research. A paper for the Proceedings of the Human Factors Society 18th Annual Meeting, Huntsville, Alabama, 15 - 17 October 1974, 441-451.

The work reported here had three main objectives with respect to computer-administered instruction (CAI), viz., to make CAI: (1) easier to develop, (2) higher in quality, and (3) more widely appreciated and accepted. The approach taken toward these goals included two complementary kinds of efforts. One effort was directed toward designing guidelines and models of CAI which can assist training program developers in their efforts to implement CAI. Another effort was applied to the construction and field evaluation of a trainer which was based on descriptions and principles of CAI as contained in the guidelines and models. These efforts and some of their results are discussed here.

1975

50. Cooper, F. R., Harris, W. T. and Sharkey, V. J. Effects of visual system time delay on pilot performance. Proceedings of the Eighth Naval Training Equipment Center/Industry Conference, Orlando, Florida, 18 - 20 November 1975.

The effects of delay in the presentation of visual information on pilot performance during simulated carrier landing tasks were investigated. The TRADEC research flight simulator was used in conjunction with an Evans and Sutherland LDS 1 calligraphic visual display system for several different initial conditions, with and without delayed visual presentation, in conducting evaluations of pilot learning performance and piloting technique. The experimental construction, conduction, data analysis and results are presented herein.

51. Puig, J. A. and Gill, S. Evaluation of an automated flight training system. Proceedings of the Eighth Naval Training Equipment Center/ Industry Conference, Orlando, Florida, 18 - 20 November 1975.

An experiment was conducted to determine the effectiveness of an automated, adaptive system in training Naval aviators to fly ground controlled approaches (GCA's). The training course was comprised of seven different types of GCA's arranged in order of increasing difficulty. The GCA Module (GCAM) was integrated with a TA-4J Operational Flight Trainer (Device 2F90). Comparison of automated and conventional training was made. In general, the hypothesis that training with the automated system would be as effective as conventional instructor training, was confirmed.

52. Blaiwes, A. S. and Weller, D. R. New Approaches to social instruction. Proceedings of the Eighth Naval Training Equipment Center/Industry Conference, Orlando, Florida, 18 - 20 November 1975.

Computer-administered training programs for teaching socially-related skills and behaviors to Navy recruit company commanders were developed and evaluated. This report describes some of the problems encountered in this effort related to the compilation of training objectives, the development of training techniques, and transfer situation considerations. Some approaches and associated rationale for solution of these problems also are presented. Results from experimental field tests of the training programs indicated that the training programs altered behaviors performed by company commanders which, in turn, were responsible for improved attitudes in recruits. More traditional measures of organizational success also were found to be related to the objectives of the training programs. It appears that interpersonal skills can be taught; that they can benefit organizational goals; and that computers can contribute to this instruction.

1975

53. Breaux, R. and Goldstein I. Developments of machine speech understanding for automated instructional systems. Proceedings of the Eighth Naval Training Equipment Center/Industry Conference, Orlando, Florida, 18 - 20 November 1975.

Computer managed, individualized, automated self-paced instruction has advantages in training efficiency and trainee motivation. Yet vocal command type jobs, such as radar controller have traditionally been trained using subjective rating scales and high manpower costs. Computer speech understanding technology can provide objective assessment of vocal commands and, thereby, can provide objective input to self-paced computer managed instructional systems. A laboratory version of the Precision Approach Controller radar trainer has successfully demonstrated the feasibility of prototype development. Training vocal commands, with computer speech recognition technology, for the radar controller, landing signal officer onboard the carrier, and officer of the deck in ship mooring, for example, is feasible using self-paced, computer managed instructional systems.

54. Montemerlo, M. D. Instructional systems development state of the art and directions for the future. Proceedings of the Eighth Naval Training Equipment Center/Industry Conference, Orlando, Florida, 18 - 20 November 1975.

This paper presents a review of the Instructional Systems Development literature which was accomplished in order to descern the relevant issues, and to determine which have been settled and which require further research and development. The state of the art was found to be highly unsettled. No theoretical or empirical basis could be found for the reduction of training program design to a manual. The existing manuals were found to differ in the steps they included and in the operational definitions of each step. All of the manuals were found to be incomplete and none had been empirically validated. Strategies for research to remediate these problems are summarized.

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